

AMENDMENTS TO THE CLAIMS:

The following listing of claims replaces all prior listings, and all prior versions, of claims in the application:

Listing of Claims:

1.-3. (cancelled)

4. (new) A method for manufacturing a semiconductor device, comprising the steps of:

forming a multilayer film including an insulation layer on a semiconductor substrate;

forming a resist mask by patterning a resist applied on said multilayer film; etching said multilayer film using said resist mask; removing said resist mask after completing said etching; and processing said semiconductor substrate to create a trench, having an upper end portion, utilizing said multilayer film having removed said resist as mask,

wherein said step of processing the semiconductor substrate includes providing a roundness to the upper end portion of the trench by adhering a reaction product composed at least of said semiconductor substrate and a reaction gas to side wall portions of said multilayer film.

5. (new) A method for manufacturing a semiconductor device according to claim 4, wherein said multilayer film comprises at least a silicon nitride layer and a silicon oxide layer.

6. (new) A method for manufacturing a semiconductor device according to claim 4, characterized in performing a desired round-off processing by controlling the reaction product, gaseous species, and gas flow rate to round off the upper portion or a bottom portion of said trench.

7. (new) A method for manufacturing a semiconductor device, comprising the steps of:

forming a multilayer film including an insulation layer on a semiconductor substrate;

forming a resist mask by patterning a resist applied on said multilayer film;

etching said multilayer film using said resist mask;

removing said resist mask after completing said etching; and

processing said semiconductor substrate to create a trench, having an upper portion, utilizing said multilayer film having removed said resist as mask,

wherein said step of processing the semiconductor substrate includes providing a round-off processing to the upper portion of the trench of said semiconductor substrate, using a reaction gas including hydrogen.

8. (new) A method for manufacturing a semiconductor device according to claim 7, wherein said multilayer film comprises at least a silicon nitride layer and a silicon oxide layer.

9. (new) A method for manufacturing a semiconductor device according to claim 7, characterized in performing a desired round-off processing by controlling

the reaction product, gaseous species, and gas flow rate to round off the upper portion or a bottom portion of said trench.

10. (new) A method for manufacturing a semiconductor device, comprising forming a multilayer film including an insulation layer on a semiconductor substrate, subsequently patterning a resist to create a resist mask, subsequently etching said multilayer film, subsequently removing said resist mask, and subsequently first etching said semiconductor substrate by using a halogen system mixed gas, having as a mask said multilayer film having removed said resist mask, and subsequently second etching said semiconductor substrate by using a mixed gas including Cl₂, O₂, and HBr and utilizing the multilayer film as a mask, wherein a desired round-off processing is performed by controlling etching time and bias voltage of said first etching and said second etching.

11. (new) A method for manufacturing a semiconductor device, comprising the steps of:
forming a mask layer having openings corresponding to element isolation regions on a semiconductor substrate;
etching said semiconductor substrate utilizing said mask layer as a mask, to form upper end portions of a trench in tapered shape; and
etching said semiconductor substrate utilizing said mask layer as a mask to form a main trench portion,
wherein a desired round-off processing is performed by controlling etching

time and bias voltage of the step of forming the tapered shape and the step of forming the main trench portion.